INTERACTION BETWEEN SEABIRDS AND THE SPANISH SURFACE LONGLINE FISHERY TARGETING SWORDFISH IN THE SOUTH ATLANTIC OCEAN (SOUTH OF 25ºS) DURING THE PERIOD 2010-2014

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SUMMARY

*A total of 92 sets (132,268 hooks) targeting swordfish between years 2010-2014 in the South Atlantic (Lat ≥ 25ºS) were analyzed. Various baits were used for night setting with monofilament longlines. No interaction with seabirds was detected and the interaction was therefore nil. The night setting, low levels of lighting during fishing operations and the type of fishing conducted were identified as the most important factors to explain the lack of interaction with seabirds. Observations of seabirds were also made during the study. Most sightings occurred during daytime sailing. During some operations when vessels were setting or hauling there were sporadic sightings of the spectacled petrel (*Procellaria conspicillata*) and the occasional albatross, although no interaction with fishing operations occurred. The species most often seen was the spectacled petrel (*Procellaria conspicillata*), with groups at over 150 individuals. Other species observed were* Calonectris diomedea, *various types of storm petrels, and other species such as* Hydrobates leucorhous, *Thalassarche chlororhynchos, Diomedea exulans and very rarely* Thalassarche melanophrys.

RÉSUMÉ

*Un total de 92 opérations (132.268 hameçons mouillés) ciblant l'espadon entre 2010 et 2014 dans le sud de l'Atlantique (latitude ≥ 25ºS) a été analysé. Plusieurs types d'appâts ont été utilisés pour le mouillage nocturne au moyen de palangres en monofilament. Aucune interaction avec des oiseaux de mer n'a été constatée et le taux d'interaction était dès lors nul. On a identifié que le mouillage nocturne, les faibles niveaux d'éclairage pendant les opérations de pêche et le type de pêche réalisée constituent les facteurs les plus importants expliquant l'absence d'interaction avec les oiseaux de mer. Des observations d'oiseaux de mer ont également été réalisées pendant l'étude. La plupart des observations ont eu lieu pendant la navigation diurne. Pendant quelques opérations de mouillage ou de hissage, quelques pétrels à lunettes (*Procellaria conspicillata*) et albatros ont été observés sporadiquement, mais aucune interaction avec les opérations de pêche n'a eu lieu. L'espèce la plus souvent observée était le pétrel à lunettes (*Procellaria conspicillata*), en colonie de 150 individus. Les autres espèces observées étaient* Calonectris diomedea, *plusieurs types de pétrel tempête*, Hydrobates leucorhous, *Thalassarche chlororhynchos, Diomedea exulans et très rarement* Thalassarche melanophrys.

RESUMEN

*Se analizaron en total 92 lances (132.268 anzuelos) que se dirigían al pez espada entre los años 2010-2014 en el Atlántico sur (Lat ≥ 25ºS). Se utilizaron diversos cebos durante las mareas de lance nocturno realizadas con palangre de estilo monofilamento. No se detectaron interacciones con aves marinas y la interacción fue, por tanto, nula. El lance nocturno, la baja iluminación durante la pesca, junto con el tipo de práctica de pesca realizada fueron identificados como los factores más importantes para explicar la nula interacción ocurrida con aves marinas. También se realizaron observaciones de aves marinas durante el estudio La mayoría de los avistamientos se realizaron durante la navegación diurna. Durante algunas operaciones de largada y virada se observó esporádicamente algún individuo de petrel de antifaz (*Procellaria conspicillata*) y algún albatros ocasional sin que en ningún caso se produjeran interacciones con las operaciones de pesca. La especie más frecuentemente avistada fue el petrel de antifaz (*Procellaria conspicillata*) con agrupaciones de más de 150*

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individuos. Otras especies avistadas fueron Calonectris diomedea*, diversas especies de paiños, y otras especies como* Hydrobates leucorhous, Thalassarche chlororhynchos, Diomedea exulans *y muy raramente* Thalassarche melanophrys*, entre otras.*

KEYWORDS

Seabirds, surface longline, interaction, South Atlantic

1. Introduction

The anthropogenic death of seabirds can be caused by various factors including eating or being caught up in plastic and the impact of various chemicals pollutants. Major spills of oil and oil derivatives have been identified as one of the most visible causes of mortality among seabirds. The introduction of predators in the areas where they nest, the impact of human activity on their natural habitats and climate change have also been identified as factors contributing to the decline in some seabird populations.

Some fishing operations, such as those carried out with driftnets, purse seine-FADs, longlines and other types of gears may have unwanted effects and cause deaths among some seabirds. The problem has been generalised on the assumption that the overlap between the areas of distribution of different seabird populations and the distribution of fishing activity using different types of gears necessarily implies an interaction between the two leading to the death of birds. However, fishing can involve a wide range of practices with greater, lesser or zero impact on the populations of seabirds present in each fishery area (Brothers *et al.* 1999). The level of interaction depending on a variety of factors linked to the behaviour and distribution of the birds, the methods and equipment used to catch each target species, the fishing pattern followed, etc. In other cases, fishing activity can consolidate or increase the number of seabirds present in a fishing area (Furness 2003) and establish a link with the discards and waste produced in the course of fishing activity (Santos *et al.* 2011, Valeiras 2003, Valeiras *et al.* 2009). It has often been pointed out that the greatest interaction with seabirds is associated with high latitudes and the productive cold water areas where much international fishing activity takes place. Although this generalisation is useful, especially for certain species considered vulnerable, the information available (i.e. García-Barcelona *et al.* 2010[a,b,c], 2013; Baez *et al.* 2014, Valeiras and Camiñas 2003) suggests that this generalisation must be qualified in the case of certain geographical areas and species.

In the case of the different types of longline (surface, mid-water, deep, demersal) there is a wide variety of target species and fishing practices, ranging from cold to tropical regions, and these can determine the greater or lesser interaction with the different species of seabirds to be found in each fishing ground. The areas and periods in which fishing takes place have been described as significant factors to explain the interaction of some of this activity with seabirds (BirdLife International 2004, Baker *et al.* 2007, Jiménez *et al.* 2010, Tuck *et al.* 2011, Yeh *et al.* 2012). However, the target species and the fishing strategy applied in each case also have a significant influence on interaction, so that it may vary considerably depending on whether fishing is by day or by night, the type and size of bait used and other factors linked to the method used and to environmental factors. The choice of prey of the birds present in the fishing area and the specific mitigation measures applied, or those implicit in each fishing technique, are elements to be taken into account in the wide range of situations described in the literature.

Longlines used for tuna and tuna-like species are often mistakenly assumed to be similar, all being classified as pelagic longlines or drifting longlines. It has been seen that the size and bait used on the hooks during setting can sometimes lead to this interaction, but it also depends on variables of time and location. Even with this type of longline there is a wide range of impacts depending on each type of longline and fishing ground (i.e. Anderson *et al.* 2011, García-Barcelona *et al.* 2010[a,b,c], 2013; Inoue *et al.* 2012[a,b], Jiménez *et al.* 2011, Mejuto *et al.* 2008, Yeh *et al.* 2012), so that preventive measures, when they are necessary, must be adapted to each situation if they are to be effective (Gilman *et al.* 2005). The type/style of longline, the target species, the distance from the coast of fishing activity (or the proximity of ocean islands in areas of possible overlap with these species) and the bird populations present in each area, can play a significant role in favouring a greater or lesser presence of birds and interaction with them (Brothers *et al.* 1999). The same type of longline used at similar latitudes can have very different impacts depending on whether fishing activity targets one species or another, whether fishing is deep sea or coastal, and whether it is carried out by day or by night with a view to adapting it to the behaviour and availability of the respective target species, among other factors. Longlines used for tuna and tuna-like species may be of different types (e.g. surface, deep, mixed), styles (e.g. monofilament, multifilament), and different

technologies and configurations may be applied, depending on the target species. However, from the point of view of their potential impact on seabirds, and irrespective of the technique used for each type of longline, at least two major categories must be considered: those set at night and those set during the day.

In any case, independently of the wide range of factors affecting the interaction between seabirds and fishing and the greater or lesser impact of each fishing ground, numerous international agreements have been signed to study these problems and propose effective measures to mitigate them in each case to help protect these species. ICCAT, like other RFOs, has been taking measures to assess this impact on the fisheries for which it is responsible (see Anon. 2016[a], Lewison *et al*. 2005). This factor, together with others, must be considered in any assessment of death rates among these bird populations (see Croxall *et al.* 2012). ICCAT and some national authorities in their domestic legislation have implemented specific recommendations to minimise the possible impact.

This document describes the interaction with seabirds observed during the activity of the Spanish surface longline fishery targeting swordfish in the South Atlantic Ocean (Lat ≥ 25º S) following the recommendations of the Working Plan of the S.C. on Ecosystems (Anon. 2016[b]). Sightings of seabirds in areas being fished during the expeditions observed are also described. A summary of the mitigation measures to deal with the problem of seabirds implemented by Spain in its surface longline fishery is also provided.

2. Material and methods

The data analysed come from scientific observers on board surface longline fishing vessels targeting swordfish and using night setting. Historically, the practices of this fishing fleet targeting swordfish have been adapted to the vertical migration of the species (Abascal *et al.* 2010, 2015; Neilson *et al.* 2009), the swordfish being more accessible in surface waters at night. The vessels observed were engaged in commercial fishing with American style (monofilament) surface longlines, and did not change the fleet's standard practices. All the sets and hauls (all the hooks) were observed, so that any interaction with seabirds during the expeditions was recorded. Following the recommendations of the Working Plan (Anon. 2016[b]), the records selected for this analysis include the observations from areas in the South Atlantic (Lat ≥ 25º S) obtained in the period 2010-2014 (the data for Task II-2015 are not available). The months during which the observations were made were also considered from the point of view of their possible influence on interaction. The bait used was also recorded in case seabirds preferred certain types. As well as recording interaction, observers with expert knowledge of seabirds carried out taxonomic identification of the species sighted.

3. Results and discussion

3.1 Sightings and interaction rates

A total of 92 sets (132,268 hooks) recorded in the areas selected between the months of November and March in the period 2010-2014 were analysed. **Figure 1** shows the position of the sets observed and the nominal effort (Task II-effort) of the fleet in latitudes ≥ 25º S, during the combined period. Different types and combinations of baits were used in the sets observed: a combination of squid and mackerel (31.5% of sets), mackerel and occasionally pieces of blue shark and other damaged species (37.0% of sets), and squid (31.5% of sets).

No interaction with seabirds was detected during any of the sets/hooks observed and the interaction rate was therefore nil. This rate is not unusual for this type of night setting targeting swordfish in open ocean areas of the Atlantic. Previous scientific observations in much more extensive and very frequent fishing areas of the North and South Atlantic (47ºN-25ºS/0ºW-47ºW) with a total of 342 sets observed (430,300 hooks) also recorded zero rates of interaction with seabirds (Mejuto *et al.* 2008). Other analyses of 505,000 hooks observed in different open ocean areas where this fleet regularly fish in the South Atlantic in the period 2011-2014 also recorded zero rates of interaction with seabirds (ACAP reports[2]).

The nominal effort of the Spanish surface longline fleet in the selected areas (Lat ≥ 25º S), during the period analysed represented between 43.3% and 50.3% (mean = 45.7%) of the total nominal effort of the fleet targeting swordfish in the South Atlantic stock-areas (South of 5º North) **(Figure 2)**.

[2] Informes ACAP sobre estimaciones de la captura incidental de aves marinas de la flota española, 2011-2014. Spanish Institute of Oceanography.

Although there was no interaction with seabirds, it is useful to consider the sightings recorded during the expeditions observed. On one of the trips there were sightings of the spectacled petrel (*Procellaria conspicillata*), which was the most abundant species, the black-browed albatross (*Thalassarche melanophrys),* giant albatross (Genus Diomedea*)* and grey-headed albatross (*Thalassarche chrysostoma).* Most of these sightings were during navigation but on some occasions, when setting or hauling were taking place, there were sporadic sightings of the spectacled petrel (*Procellaria conspicillata*) and the occasional albatross, although no interaction with fishing operations occurred. The sightings recorded on another trip also identified the main species present, although during setting the presence of birds was scant, probably because work on setting lines normally began with very little light. The largest numbers of seabirds in fishing areas were seen during hauling and mainly in the middle of the day, although the frequency of sightings varied greatly from one area to another. The species most frequently sighted was the spectacled petrel (*Procellaria conspicillata)* with groups of up to 150 birds. They nest exclusively on Tristan da Cunha and their presence diminished significantly as the vessel sailed north. The species *Procellaria conspicillata*, *Calonectris diomedea* and various types of storm petrels were also seen, the most frequent among the latter being Wilson's storm petrel (*Oceanites oceanicus*) and Leach's storm petrel (*Hydrobates leucorhous*), although they were only sighted in some areas where lines were set. Only three species of albatross were seen, the most frequent being the Atlantic yellow-nosed albatross (*Thalassarche chlororhynchos*), with very occasional sightings of the wandering albatross (*Diomedea exulans*) and on some days the black-browed albatross (*Thalassarche melanophrys*). Another species seen sporadically was the red-billed tropicbird (*Phaethon aetherus*). The white tern (*Gygis alba*) was sighted occasionally during sets in areas near Saint Helena, while the brown skua (*Catharacta antarctica*) was seen on only two occasions. The Cape gannet (*Morus capensis*) was seen occasionally. Although day-time sightings of seabirds seem to have been frequent in some of the fishery areas analysed in different studies, interaction between this type of fishing gear and seabirds in different areas of the South Atlantic was nil.

The scientific observers partly attributed this lack of interaction to two aspects of the routine followed. On the one hand, setting is generally carried out with very little daylight, mainly at dusk or when night has fallen. There is no waste that might attract birds and deck lighting is limited to what is strictly necessary for the safety of the vessel and the crew. On the other hand, the slow speed during setting of both the vessel and the line setter, which is designed to pull monofilament longlines from the spool at a rate greater than or equal to the speed of the vessel, allows the branchlines carrying the hooks and bait to sink more rapidly. In the sets described in this document the vessels did not use tori lines, in spite of which no bird was accidentally caught or injured by any part of the gear.

3.2 Implementation of measures for mitigation

Records for the Spanish surface longline fleet targeting swordfish in the South Atlantic since 2005 indicate that there is normally no interaction of this kind. However, since before REC-07-07 came into force, the Administración Nacional Pesquera of Spain (ANP) has been implementing various precautionary measures to reduce the likelihood of such interaction. In addition to Spanish and EU legislation applicable to the longline fishing fleet, which limits capacity and access to certain stocks and areas, and the use of VMS and other systems are implemented to track activity, since 2002 the ANP has been implementing measures for mitigating the potential impact of fishing on seabirds[3] via the Official State Gazette and also within the scheme for Temporary Fishing Permits. These are individual permits granted annually to each vessel in the census of those authorised to engage in fishing. The permit establishes conditions which are specifically applicable to each vessel, such as the areas in which it is authorised to fish, the mitigation measures required in each area, species allowed and prohibited, minimum sizes and other conditions affecting the vessel's activity. These guidelines include specific measures to avoid possible interaction with seabirds, based on the current recommendations of each RFO and domestic regulations.

Since 2002, in response to Order APA/1127/2002, mitigation measures have been implemented which are applicable to all surface longline fishing vessels flying the Spanish flag and targeting swordfish and similar species in waters south of 30º S, irrespective of the ocean in which they carry out their activity. Additionally, in the case of ICCAT, measures based on REC-07-07 and REC-11-09 have been put in place since 2008. More recently, via Order AAA/658/2014[4] the ANP has established precautionary measures which are stricter than those specified in REC-07-07 and REC-11-09 and are applicable to the whole Spanish surface longline fleet irrespective of the area or ocean in which they are authorised to fish. **Table 1** gives a brief summary of the measures implemented by the Spanish ANP since 2002 regarding migratory species captured by surface longline fishing vessels.

[3] Order APA/1127/2002 of 13 May. Ministry of Agriculture, Fisheries and Food. Official State Gazette no. 123, 23 May 2002.
[4] Order AAA/658/2014 of 22 April. Ministry of Agriculture, Food and the Environment. Official State Gazette no. 102, 28 April 2014.

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References

Abascal, F.J., Mejuto, J., Quintáns, M. and Ramos-Cartelle, A. 2010. Horizontal and vertical movements of Swordfish in the Southeast Pacific. ICES J. Mar. Sci. 67: 466–474.

Abascal, F.J., Mejuto, J., Quintáns, M., García-Cortés, B. and Ramos-Cartelle, A. 2015. Tracking of the broadbill swordfish, *Xiphias gladius*, in the central and eastern North Atlantic. Fisheries Research 162:20-28.

Anderson, O.R.J., Small, C.J., Croxall, J.P., Dunn, E.K., Sullivan, B.J., Yates, O. and Black, A. 2011. Global seabird bycatch in longline fisheries. Endang Species Res, 14: 91–106.

Anon. 2016[a]. ICCAT Report for the biennial period, 2014-15, Part II (2015) – Vol. 2, Report of the Standing Committee on Research and Statistics 2015 (SCRS): 351pp

Anon. 2016[b]. Inter-sessional Meeting of the Sub-Committee on Ecosystems. Madrid, Spain, 8-12 June 2015. Collect. Vol. Sci. Pap. ICCAT. 72(7): 1877-1948.

Báez, J.C., García-Barcelona, S., Mendoza, M., Ortiz de Urbina, J.M., Real, R. and Macías, D. 2014. Cory's shearwater by-catch in the Mediterranean Spanish commercial longline fishery: implications for management. Biodivers Conserv, 23: 661–681.

Baker, G.B., Double, M.C., Gales, R., Tuck, G.N., Abbott, C.L., Ryan, P.G., Petersen, S.L., Robertson, C.J.R. and Alderman, R. 2007. A global assessment of the impact of fisheries-related mortality on shy and white-capped albatrosses: conservation implications. Biol. Conserv. 137: 319–333.

BirdLife International. 2004. Tracking ocean wanderers: the global distribution of albatrosses and petrels. In Results from the Global Procellariiform Tracking Workshop. Cambridge, UK: 11–49. BirdLife International (Ed.).

Brothers, N.P., Cooper, J. and Løkkeborg, S. 1999. The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation. FAO Fisheries Circular No. 937 FIIT/C937.

Croxall, J.P., Butchart, S.H.M., Lascelles, B., Stattersfield, A.J., Sullivan, B., Symes, A. and Taylor, P. 2012. Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International, 22: 1-34.

Furness, R.W. 2003. Impacts of fisheries on seabird communities. Scientia Marina, 67 (Suppl. 2): 33-45.

García-Barcelona, S., Báez, J.C., Márquez, A.L., Estrada, A., Real, R. and Macías, D. 2010[a]. Differential age-related phenology in lesser black-backed gull *Larus fuscus* wintering in the Málaga Area. Ardeola, 57(Especial): 129-134.

García-Barcelona, S., Macías, D., Ortiz de Urbina, J.M., Estrada, A., Real, R. and Báez, J.C. 2010[b]. Modelling abundance and distribution of seabird by-catch in the spanish mediterranean longline fishery. Ardeola 57(Especial), 65-78.

García-Barcelona, S., Ortiz de Urbina, J.M., de la Serna, J.M., Alot, E. and Macías, D. 2010[c]. Seabird bycatch in Spanish Mediterranean large pelagic longline fisheries, 2000-2008. Aquat. Living Resour. 23, 363–371.

García-Barcelona, S., Báez, J.C., Ortiz de Urbina, J.M., Gómez-Vives, M.J. and Macías, D. 2013. By-catch of cory's shearwater in the commercial longline fisheries based in the Mediterranean coast and operating in East Atlantic waters: first approach to incidental catches of seabird in the area. Collect. Vol. Sci. Pap. ICCAT, 69(4): 1929-1934.

Gilman, E., Brothers, N. and Kobayashi, D.R. 2005. Principles and approaches to abate seabird by-catch in longline fisheries. Fish and Fisheries, 6: 35–49.

Inoue, Y., Yokawa, K., Minami, H. and Ochi, D. 2012[a]. Preliminary view of by-catch hotspot: distribution of seabirds from tracking data, interaction map between seabird distribution and longline effort and by-catch distribution in the ICCAT convention area of the southern hemisphere**.** Collect. Vol. Sci. Pap. ICCAT, 68(5): 1784-1812.

Inoue, Y., Yokawa, K., Minami, H., Ochi, D., Sato, N. and Katsumata, N. 2012[b]. Distribution of seabird by-catch using data collected by Japanese observers in 1997-2009 in the ICCAT area. Collect. Vol. Sci. Pap. ICCAT, 68(5): 1738-1753.

Jiménez, S., Abreu, M., Pons, M., Ortiz, M. and Domingo, A. 2010. Assessing the impact of the pelagic longline fishery on albatrosses and petrels in the southwest Atlantic. Aquat. Living Resour. 23: 46–94.

Jiménez, S., Domingo, A., Abreu, M. and Brazeiro, A. 2011. Structure of the seabird assemblage associated with pelagic longline vessels in the Southwestern Atlantic: implications for bycatch. Endang. Species Res 15: 241–254.

Lewison, R.L., Nel, D.C., Taylor, F., Croxall, J.P. and Rivera, K.S. 2005. Thinking big—Taking a large-scale approach to seabird bycatch. Marine Ornithology, 33: 1–5.

Mejuto, J., García-Cortés, B. and Ramos-Cartelle, A. 2008. Trials using different hook and bait types in the configuration of the surface longline gear used by the Spanish swordfish (*Xiphias gladius*) fishery in the Atlantic Ocean. Collect. Vol. Sci. Pap. ICCAT, 62(6): 1793-1830.

Neilson, J.D, Smith, S., Royer, F., Paul, S.D., Porter, J.M. and Lutcavage, M. 2009. Investigations of horizontal movements of Atlantic swordfish using pop-up satellite archival tags. In: Nielsen, J.L., Arrizabalaga, H., Fragoso, N., Hobday, A., Lutcavage, M., Sibert, J. (Eds.), Tagging and Tracking of Marine Animals with Electronic Devices, Reviews: Methods and Technologies in Fish Biology and Fisheries, 9. Springer, New York, pp. 145–159 (452 pp).

Santos, M.B., Valeiras, X., Fernández, R., Garcia, S., Canoura, J., Cedeira, J., Morales, X., Caldas, M. and Pierce, G.J. 2011. The PELACUS oceanographic surveys from the Instituto Español de Oceanografía (IEO): A platform for the study of seabirds in the North Iberian Peninsula pelagic ecosystem. Actas del 6º Congreso del GIAM y el Taller Internacional sobre la Ecología de Paiños y Pardelas en el sur de Europa. Boletín GIAM 34: 85-89.

Tuck, G.N., Phillips, R.A., Small, C., Thomson, R.B., Klaer, N.L., Taylor, F., Wanless, R.M. and Arrizabalaga, H. 2011. An assessment of seabird–fishery interactions in the Atlantic Ocean. ICES Journal of Marine Science, 68(8): 1628–1637.

Valeiras, X. 2003. Attendance of scavenging seabirds at trawler discards off Galicia, Spain. Scientia Marina 67 (Suppl. 2): 77-82.

Valeiras, X. and Camiñas, J.A. 2003. The incidental capture of seabirds by the Spanish drifting longline fishery in the western Mediterranean Sea. Scientia Marina 67 (Suppl.2): 65-68.

Valeiras, X., Abad, E., Serrano, A. and Sánchez, F. 2009. Distribución de aves marinas en la plataforma continental de Galicia y mar Cantábrico en relación a los descartes pesquero durante el otoño. A Carriza 4(2): 97-107.

Yeh, Y-M., Huang, H-M., Dietrich, K.S. and Melvin, E. 2012. Estimates of seabird incidental catch by pelagic longline fisheries in the South Atlantic Ocean. Animal Conservation, 16 (2013): 141-152.

Table 1. Summary of mitigation measures regarding seabirds applied since 2002 to surface longline fishing vessels under the Spanish flag, based on Spanish legislation, Rec. 07-07 and Rec. 11-09.

Years / Rec.	**Mitigation measures**	**Source / Conditions**
2002-2008 APA/1127/2002	- Night setting with min. deck lighting - Fish waste discharged on opposite side to fishing operations	Order APA/1127/2002 Applied to all surface longline fishing vessels targeting tuna and tuna-like species in waters south of 30ºS in all oceans.
2008-2012 Rec. 07-07 APA/1127/2002	- Tori line (yes) - Night setting with min. deck lighting and line weighting (yes) - Fish waste discharged on opposite side to fishing operations	At least one of these measures marked (yes) must be applied to all longline fishing vessels working south of 20ºS, bearing in mind guidelines of ICCAT Recommendation 07-07.
2012-2016 Rec. 07-07 Rec. 11-09 AAA/658/2014	- Tori line (yes) - Night setting with minimum deck lighting (yes) - Line weighting - Fish waste discharged on opposite side to fishing operations	According to ICCAT regulations at least ONE of these measures will be applicable to longline fishing vessels fishing between 20º-25ºS. However, according to Art. 19 of Order AAA/658/2014, the TWO marked (yes) will be applicable to the whole Spanish surface longline fishing fleet irrespective of the area/ocean in which they fish. According to ICCAT regulations at least TWO of these measures will be applicable to longline fishing vessels fishing south of 25ºS. However, according to Art. 19 of Order AAA/658/2014, the TWO marked (yes) will be applicable to the whole Spanish surface longline fishing fleet irrespective of the area/ocean in which they fish.

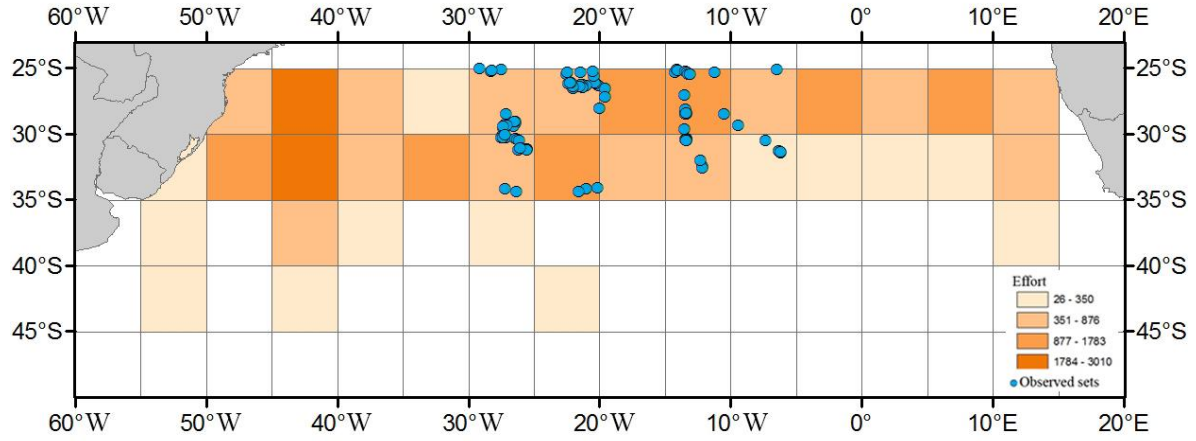

Figure 1. Position of sets observed in the South Atlantic (Latitude ≥ 25º S) from 2010-2014 (blue spots) and 5ºx5º nominal effort (Task II-thousands hooks) in these areas during the combined period (colour scale).

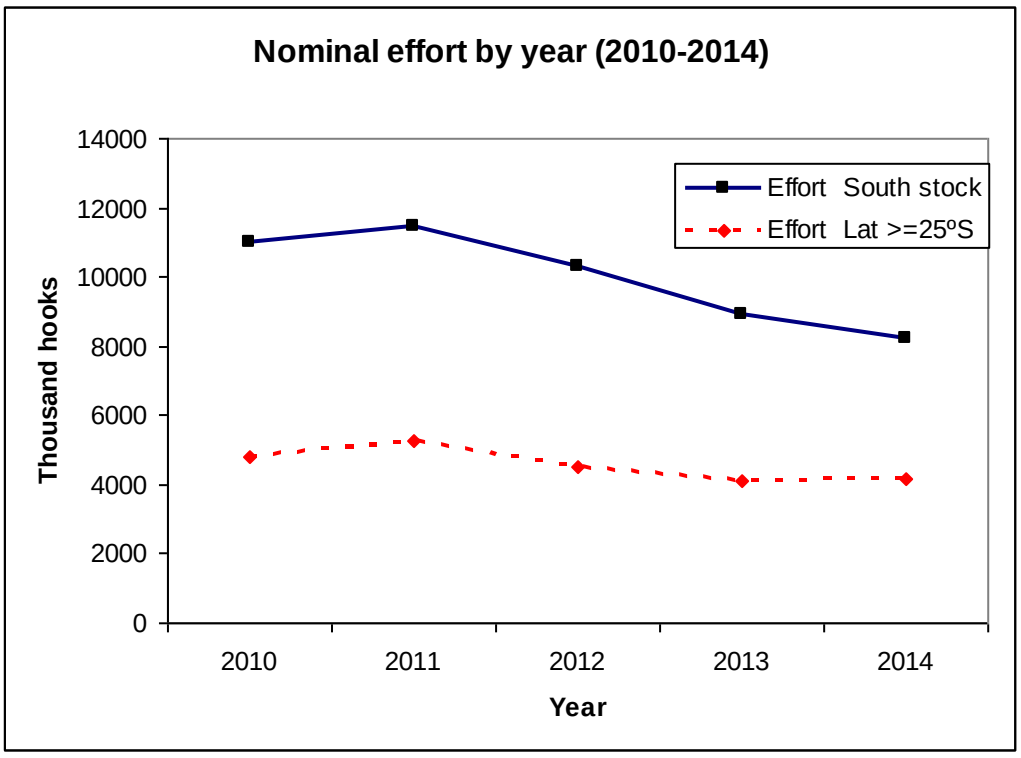

Figure 2. Nominal effort of the Spanish surface longline fleet targeting swordfish in the South Atlantic stock-areas (South of 5º N) and in the Southern areas (Lat ≥ 25º S), during the period 2010-2014.